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(54) Radio transceiver control device

(57) A control system for ensuring that a radio transceiver cannot be left in the transmit mode either by a fault or through misoperation operates by monitoring R41, 44 the current taken by the transceiver and disabling the power supply 120 from at least the transmitter section if excessive current taken by the transceiver during transmit mode is detected for greater than a predetermined time period, this time period being set at well above the normal time period for continuous transmission. After a first time period (e.g. 15 secs) warning lamp 400 may be illuminated by relay 27, but if after a further period (e.g. 1 minute) excessive current is still being drawn, relay 112 operates to disable the power supply from the transmitter, and causes flasher 115 to make lamp 400 flash.

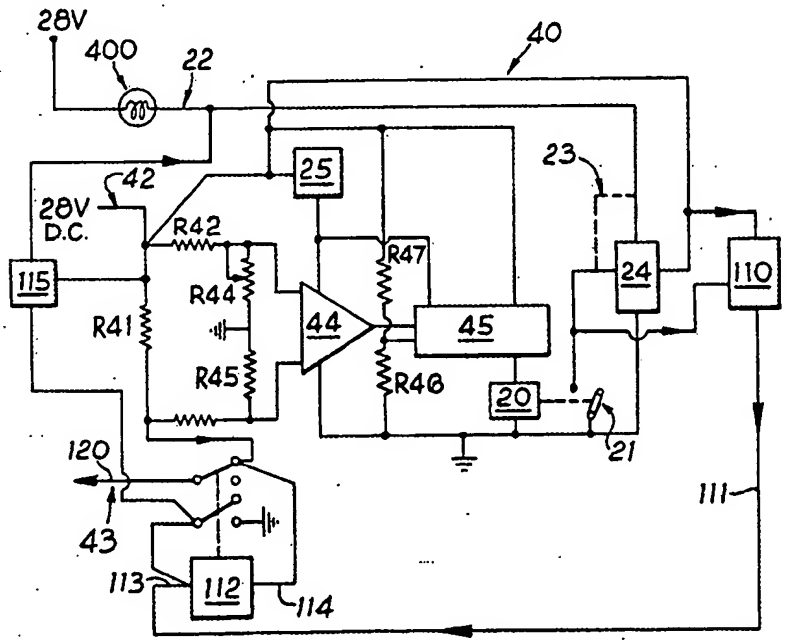

Fig. 4

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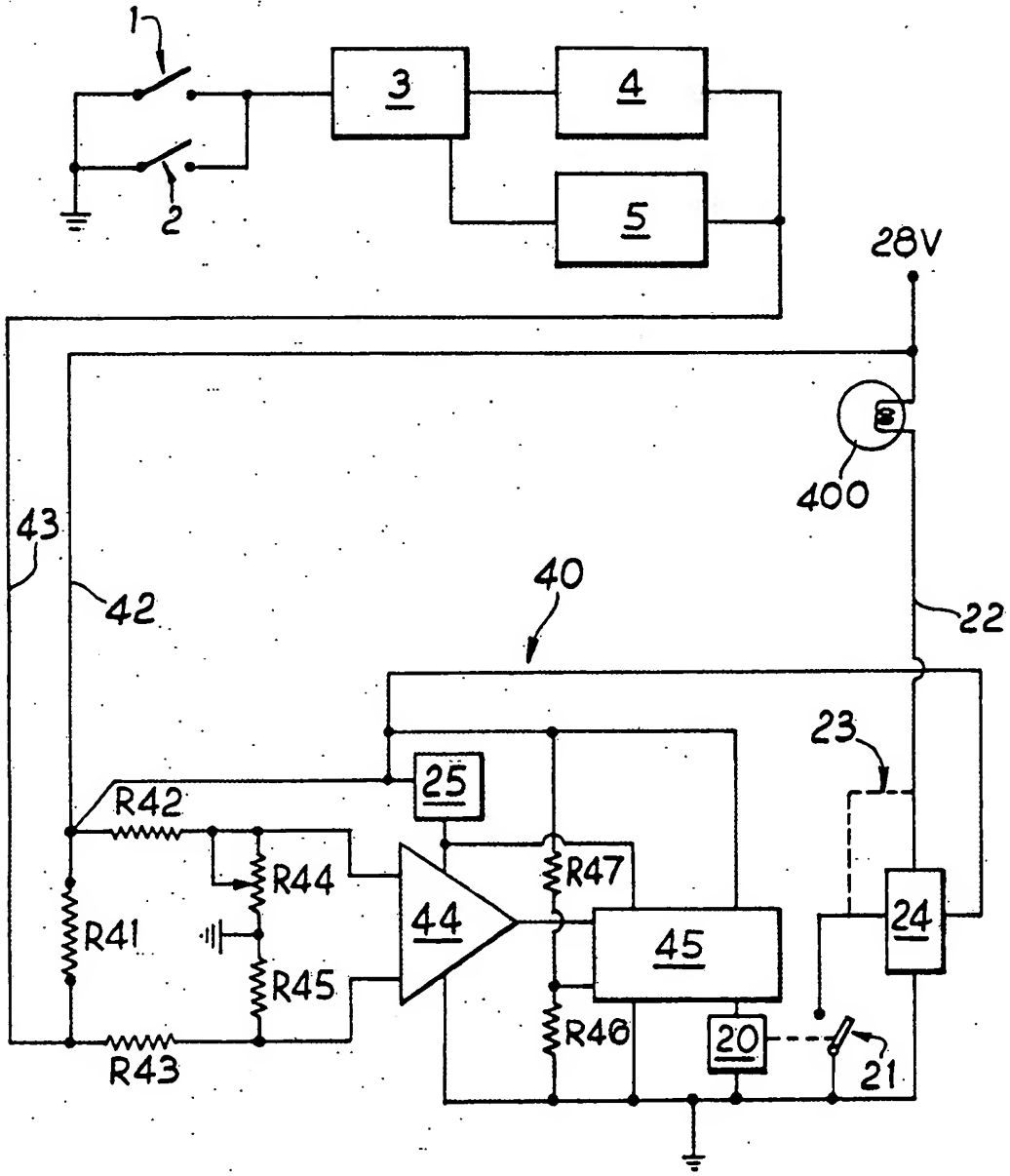
1
2
3
4
5
28V
400
43
42
40
22
23
25
R42
R44
R41
R45
R43
44
R47
45
24
R46
20
21

Fig. 1

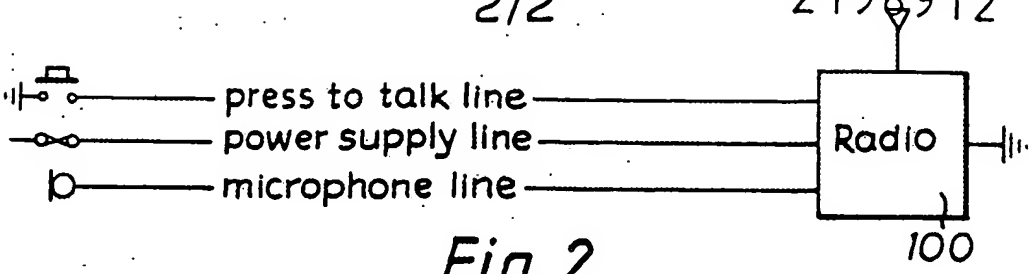

Fig. 2

Existing Two Way Radio Installation

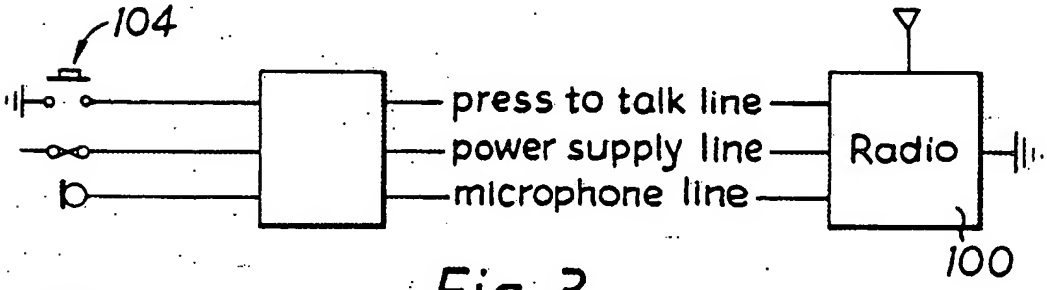

Fig. 3

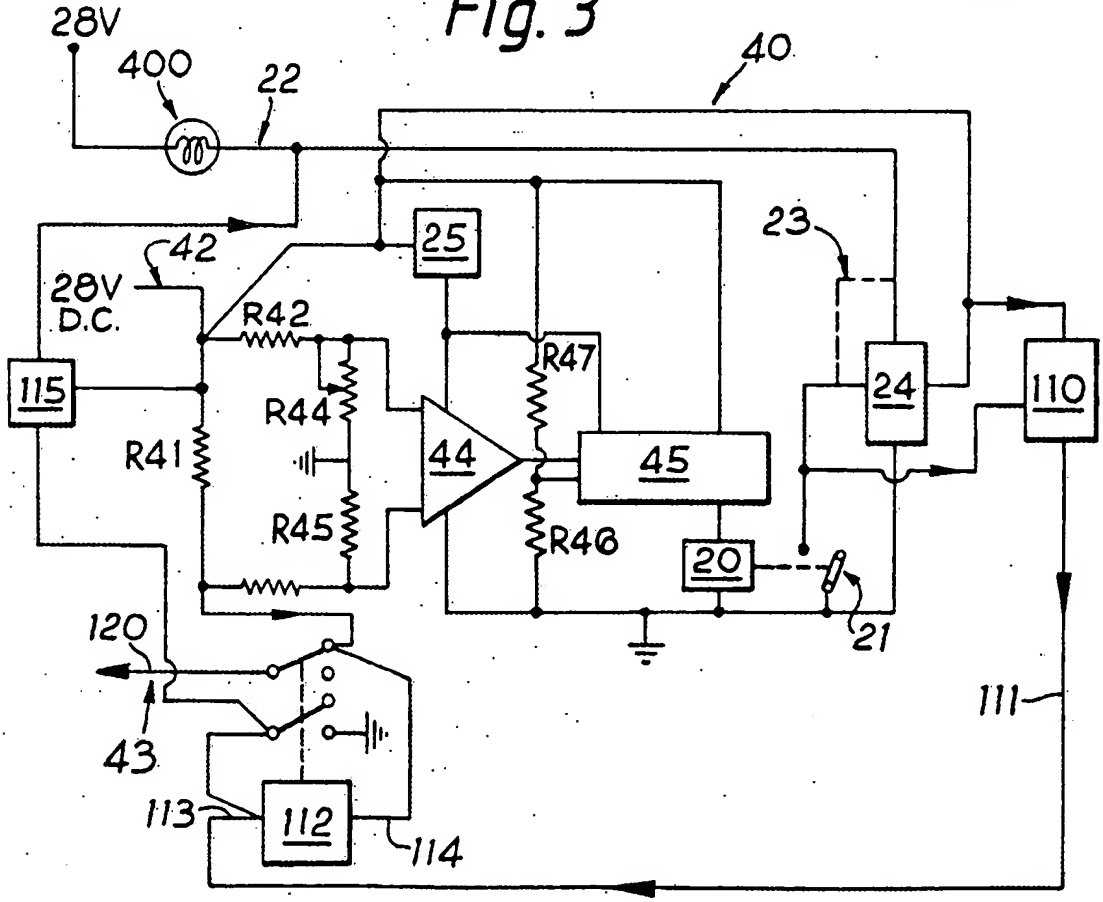

Fig. 4

RADIO TRANSMITTING AND RECEIVING APPARATUS

This invention relates to a radio transmitting and receiving apparatus and to a transmission control means for use in a radio transmitting and receiving apparatus. The apparatus is particularly applicable to aircraft voice communications.

Aircraft air-to-ground and ground-to-air voice radio communications take place within the VHF band. Airlines are equipped with VHF transmitter/receivers ("transceivers") allowing a choice of any of 720 channels spaced at 25 kHz in the range 118 to 136 MHz, and ground facilities communicate with aircraft on any single channel in that range. It is, therefore, quite normal to have as many as eight aircraft with their transceivers operating on a single VHF channel, i.e. that of a ground facility such as air traffic control.

A problem which can arise in aircraft radio communications is the problem of the "stuck microphone", where a transmitter continues to operate, either through a fault or through the press-to-talk switch being inadvertantly pressed, thus interfering with or preventing the operation of other radio apparatus on the same frequency. British Patent No. 2129656 provides a partial solution to this problem by giving a warning signal to an operator when a transmitter has been operating for over a predetermined time. This however only partially solves the problem and requires the operator to take action. If for any reason the operator is either not able to take action or the aircraft or other vehicle is unattended then the transmission continues.

It is an object of the present invention to alleviate this problem.

According to the invention, there is provided a transmission control means for use in radio transmitting

and receiving apparatus including a current monitoring unit for monitoring the current taken by the transceiver, the unit including an input terminal for connection to a power source and an output terminal for connection to the transceiver to supply power thereto, the unit including means for providing a warning alarm signal to an operator when the transceiver is taking current in excess of a predetermined minimum, and including means for removing the power supply from at least the transmitter of said transceiver when said current in excess of the predetermined minimum has been flowing for a continuous predetermined period of time.

Preferably the predetermined minimum level is set just below the normal level of current taken by the transceiver when it is in its transmit mode.

Preferably the unit includes means for incorporating a substantial delay from the instant of first detection of a current in excess of the predetermined mimimum until the warning alarm signal is given.

In a preferred embodiment the substantial delay is approximately 15 second and the continuous predetermined period of time is approximately one minute.

Embodiments of the present invention will now be described, bu way of example with reference to the accompanying drawings in which:-

Figure 1is a circuit diagram of an apparatus in according witn the invention.

Figure 2 is a diagrammatic circuit of the control lines to a simple radio receiver;

Figure 3 shows diagrammatically the present invention; and

Figure 4 shows an embodiment of the present invention in greater detail.

The apparatus of Figure 1 comprises a transmitter circuit 4, a receiver circuit 5 and a transmit-enable

circuit 3 arranged to select between a transmit mode, wherein the transmitter circuit 4 functions while the receiver circuit is inoperative, and a receive mode, wherein the receiver circuit 5 functions while the transmitter circuit is inoperative. Press-to-talk switches 1 and 2 are operable by, for example, an aircraft's captain and co-pilot, to ground the line to the transmit-enable circuit 3, thus causing it to operate. Power is supplied to the transmitter and receiver circuits via line 43, which is connected to the current monitoring and warning circuit 40.

Line 42 is connected from the circuit 40 to the power source for the transceiver, the aircraft 28 volt DC power supply. Thus, the circuitry 40 is connected between the power supply and the transceiver, and the transceiver supply current can be routed through a low value resistor R41 (e.g. 0.01 ohms 5 watt 15 amp rating). The voltage drop across this resistor R41 is directly proportional to the current through it and this voltage differential is detected and amplified by a differential amplifier 44 (SN7270N or equivalent) connected to either side of the low value resistor R41 through respective resistors R42 and R43 (each 100k).

The output from the differential amplifier 44 is passed to a commercially-available relay driver 45 (DS3686N or equivalent), for which resistors R46 (350) and R47 (2.5k), connected respectively to ground and to the 28V supply, give a reference voltage.

In the receive mode of the transceiver, the voltage differential across the low value resistor R41, amplified by the differential amplifier 44 is below the threshold, adjustably determined by the bridge formed by variable resistor R44 (1k) and fixed resistor R45 (1k), to cause the relay driver 45 to energise the relay 20, which thus remains de-energised with the contacts 21 thereof open.

The contacts 21 are interposed between a commercially-available time delay 24 (Series 6100-1402 by HI-G Inc. Connecticut, U.S.A.) and ground, the time delay 24 being connected by a line 22 to a warning light 400 which in turn is connected to the power supply. Alternatively, an audible warning device may be used, or a combination of the two.

The power supply for the differential amplifier 44 and the relay driver 45 is a regulated power supply 25, of conventional design, connected to the 28 volt DC aircraft power supply via line 42.

When the transceiver is switched to the transmit mode, the current through the resistor R41 increases, thus increasing the voltage differential across the differential amplifier 44. The output of the amplifier 44 is thereby raised to a level where the relay driver 45 is caused to energise the relay 20. The contacts 21 are therefore closed, supplying a ground signal which causes the time delay 24 to operate and, after a predetermined time, to allow current to flow in line 22, thereby operating the warning light 400.

In a simpler embodiment of the invention, the delay 24 is omitted, the connection to ground via contacts 21 taking the route effectively indicated by the broken line 23. In this simpler embodiment, the warning light will illuminate whenever the transmitter circuit of the transceiver is operating.

However, in most circumstances, it will be preferred to incorporate the delay so that warning is only given when the transmission time becomes unduly extended. This may happen, for example, when a press-to-talk switch as hereinbefore described becomes stuck in a closed position, either through a fault in the switch, or through inadvertant pressure on the switch. A warning will indicate to the operator that the transmitter is

operating and will enable him to take action promptly to prevent other transmissions on the same frequency being blocked.

With reference now to Figure 2 in the existing two way radio installation the press to talk, power supply and microphone line are connected directly to the radio 100.

The modification shown in Figure 3 comprises a cut out device 102 which monitors each transmission and cuts off the transmission in a predetermined manner. This cut out device 102 may be used with the embodiment of Figure 1 or on its own.

Assuming that the monitoring circuitry of Figure 1 is also installed its operation will be as follows:-

a) A warning light illuminates to advise the operator that the transmit mode is selected (preferably the warning light illuminates only have a short delay - e.g. 15 seconds).

b) If, after a predetermined time period, transmission is still detected, a fault is indicated. The device 102 reacts to this condition by removing the electrical power supply to at least the transmitting section of the radio, thereby clearing the channel from its blocking signal.

The means of determining mode of operation of the radio 100 either transmit or receive, is as in Figure 1 a current detection circuit. This relies on the fact that the receive mode consumes less current than the transmit mode. Essentially, this circuit consists of an electrical shunt whereby volts drop, across the shunt, is directly proportional to current through the shunt, and a voltage comparator used to determine current level. A means of setting a threshold level is available whereby the transition from receive to transmit will cause an output from the current level detection circuitry, this output being used to switch various, time delayed

signals. Additionally, a reset switch is fitted to allow normal operation to be resumed following rectification of a fault which has caused unintentional transmissions.

Sequence of operation.

With reference to Figure 4 which is a modification of the circuit of Figure 1 supply current, to the transceiver, passes, through resistor R41 and, as described hereinbefore is detected by amplifier 44 and either energises relay 24 via switch contacts 21 or via direct link 23 illuminates the warning lamp indicating that the transmitter is operating. In normal circumstances this will indicate to the operator (pilot or co-pilot) that the press to talk button is being depressed and if, in the preferred embodiment, the warning lamp is not illuminated until after a delay then this normally means that the transmission has been continued for an abnormally long period and should be terminated.

The operator then releases the press to talk button and the transmitter ceases operation. If the transmitter continues to operate then there are two main possible causes. Firstly the PTT button or its associated wiring and control circuitry is faulty or secondly there is an electrical fault in the transmitter. The first fault is normally readily eliminated by disconnecting the microphone but the second is not easily rectified and, in particular if the equipment in an unattended aircraft becomes faulty then the transmitter continues to operate thereby jamming the channel on which it is transmitting.

The modified circuitry of Figure 4 seeks to overcome these problems by providing a further time delay 110 connected in parallel with time delay 24 the output 111 of which is connected to one end, 113, of a control winding of a relay 112 the other end 114 of which is connected to the positive voltage supply (+28V D.C.).

Contact 113 is connected to a flasher unit 115 which when energised supplies ON/OFF power in known manner to lamp 400.

The additional circuitry operates as follows. The delay 110 is set at for example 1 minute which is considerably longer than time delay 24 (approximately 15 seconds).

If for any reason transmit level current is still flowing through R41 after 1 minute delay 110 will energise outputting an earth on line 111 energising relay 112 and, at the same time causing flasher unit 115 to operate.

Relay 112 cuts off power to at least the transmitter section of the radio by disconnecting line 120 from the 28V D.C. supply. Relay 112 is latched by its own contacts 116 connecting earth to the coil.

Power current will not then flow through resistor R4I and delays 14 and 110 will de-energise. Lamp 400, now deprived of the constant current from 24 will receive flashing current from 115 and will flash indicating a serious fault. Thus if on an aircraft on the ground the transmitter becomes faulty the aircrew will have an immediate warning by flashing light 400, on their entry into the aircraft, that there is a fault. A reset button may be provided so that on effecting a possible repair the circuit may be tested again, or the equipment may be switched off and on again to see if the fault persists.

CLAIMS

1. A transmission control means for use in radio transmitting and receiving (transceiver) apparatus including a current monitoring unit for monitoring the current taken by the transceiver, the unit including an input terminal for connection to a power source and an output terminal for connection to the transceiver to supply power thereto, the unit including means for providing a warning alarm signal to an operator when the transceiver is taking current in excess of a predetermined minimum, and including means for removing the power supply from at least the transmitter of said transceiver when said current in excess of the predetermined minimum has been flowing for a continuous predetermined period of time.

2. A transmission control means as claimed in Claim 1 in which the predetermined minimum current level is set just below the normal level of current taken by the transceiver when it is in its transmit mode.

3. A transmission control means as claimed in Claim 1 or 2 in which the current monitoring unit includes means for incorporating a substantial delay from the instant of first detection of a current in excess of the predetermined minimum until the warning alarm signal is given.

4. A transmission control means as claimed in Claim 3 in which the substantial delay is approximately 15 seconds and the continuous predetermined period of time of approximately one minute.

5. A transmission control means for use in a radio transmitting and receiving apparatus substantially as described with reference to the accompanying drawings.

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